Variable Stars

Star	R.A. h. m.	Decl. ° ′		h. m.	
U Cephei	0 52·2 ...	81 16 N. ...	Oct. 19,	5 11	*m*
R Sculptoris ...	1 21·7 ...	33 8 S. ...	,, 22,		*M*
Algol	3 0·8 ...	40 31 N. ...	,, 19,	5 25	*m*
			,, 22,	2 14	*m*
λ Tauri	3 54·4 ...	12 10 N. ...	,, 18,	0 46	*m*
			,, 21,	23 38	*m*
R Canis Minoris...	7 2·4 ...	10 12 S. ...	,, 21,		*M*
S Cancri	8 37·4 ...	19 27 N. ...	,, 21,	4 38	*m*
U Ophiuchi... ...	17 10·8 ...	1 20 N. ...	,, 18,	4 25	*m*
		and at intervals of		20 8	
β Lyræ...	18 45·9 ...	33 14 N. ...	Oct. 18,	0 0	*m*
			,, 21,	5 0	*M*
η Aquilæ	19 46·7 ...	0 43 N. ...	,, 19,	2 0	*M*
			,, 23,	21 30	*m*
δ Cephei	22 24·9 ...	57 50 N. ...	,, 18,	2 0	*m*

M signifies maximum ; *m* minimum.

Meteor Notes

There are a large number of active radiants visible during the present week, the chief shower being the *Orionids*, R.A. 90°, Decl. 15° N. Other radiants are that of the *Arietids*, R.A. 31°, Decl. 9° N. ; near ψ Aurigæ, R.A. 78°, Decl. 32° N. ; that of the *Gemellids*, R.A. 108°, Decl. 24° N. ; near μ Leonis, R.A. 143°, Decl. 28° N. ; and near Vega, R.A. 283°, Decl. 43° N. October 18 is a fireball date.

THE NEW ELEMENT, GERMANIUM[1]

SOME months ago Dr. Clemens Winkler announced the discovery of a new element which he named germanium, a preliminary account of which has already appeared in these columns. Dr. Winkler has since been able to make a more systematic examination of the subject, and he now describes in detail the preparation and properties of the new element and also of a number of its compounds. The view he first held, that germanium occupied a position in the periodic system intermediate between antimony and bismuth, he now shows to be untenable, there being now no doubt that it is the *ekasilicium* of Mendelejeff prophesied fifteen years ago. This latter view was, in fact, expressed by Richter, Mendelejeff, and Lothar Meyer shortly after the discovery of germanium.

The new element occurs, as previously stated, in the recently-discovered mineral, argyrodite. Its isolation is, however, difficult, especially from the presence of arsenic and antimony in minerals which accompany argyrodite. The formula assigned to the latter mineral is $3Ag_2S,GeS_2$.

The following is the best method for separating the germanium. The finely-powdered mineral is intimately mixed with an equal weight of soda and sulphur, and the whole submitted to the action of a moderate red heat in a Hessian crucible. The product is powdered whilst still warm, and repeatedly boiled with water; the aqueous extract is slightly acidulated with sulphuric acid, and the precipitated sulphides of arsenic and antimony allowed to settle. On then adding a considerable excess of hydrochloric acid, the germanium sulphide is thrown down as a white voluminous precipitate; this is gently roasted, then heated with concentrated nitric acid, and finally ignited. The germanium oxide obtained may be reduced by ignition in hydrogen.

Germanium has a melting-point apparently somewhat lower than that of silver—that is, about 900°—and at a temperature a little higher than this it appears to volatilise. It crystallises in octahedra, is extremely brittle, has a perfect metallic lustre, and a grayish-white colour ; its specific gravity is 5·469 at 20°·4. It is insoluble in hydrochloric acid, is readily dissolved by aqua regia, is converted into a white oxide by nitric acid, and into a soluble sulphate by concentrated sulphuric acid.

Determinations of the atomic weight of germanium were made by estimating the percentage of chlorine in the chloride, $GeCl_4$, and the number 72·32 was obtained as the mean of four experiments, this number agreeing closely with the atomic weight of Mendelejeff's ekasilicium.

The specific heat of the new element has been determined by Nilson and Pettersson, at temperatures between 100° and 440°, with the following results :—

		1	2	3	4
Specific heat	...	0·0737	0·0772	0·0768	0·0757
Atomic heat	...	5·33	5·58	5·55	5·47

Compounds of Germanium.—Oxides : There are two oxides of germanium, namely, GeO and GeO_2. The former is obtained in the hydrated condition by heating the corresponding chloride ($GeCl_2$) with sodium carbonate solution ; on heating the precipitate in a current of carbonic anhydride, the water is expelled and the grayish-black oxide, GeO, remains. The higher oxide is obtained by burning germanium in oxygen, or by decomposing the chloride, $GeCl_4$, by water ; it forms a dense white powder slightly soluble in water, possesses both basic and acid properties, the latter being, however, the more pronounced. *Sulphides :* Two of these are likewise known, corresponding to the oxides. The lower sulphide, GeS, is obtained from the disulphide either by heating it with an excess of germanium in a current of carbonic anhydride, or by gently igniting it in a current of hydrogen ; it forms beautiful thin plates of almost metallic lustre and having a gray-black colour. Germanium disulphide, GeS_2, is obtained by precipitating a solution of the dioxide by sulphuretted hydrogen with the addition of a considerable excess of a mineral acid ; it is then thrown down as a bulky white precipitate which is very appreciably soluble in water. *Chlorides :* The dichloride, $GeCl_2$, is formed when hydrochloric acid gas is passed over heated pulverulent germanium or its sulphide ; it is a thin colourless liquid, which fumes strongly on exposure to the air. The tetrachloride, $GeCl_4$, is produced by burning germanium in chlorine, or by distilling a mixture of germanium with mercuric chloride ; it is a thin colourless liquid boiling at 86° C. and fuming in the air ; its specific gravity at 18° is 1·887. *Iodide :* A tetriodide, GeI_4, only is known, and is best obtained by heating germanium in iodine vapour ; it forms a yellow powder, melts at 144°, and boils between 350° and 400°.

AUSTRALASIA

THE following have been quite recently received from Australasia :—

Transactions and Proceedings of the New Zealand Institute for 1885, vol. xviii. (first of new series) (Wellington, May 1886). This volume commences a new series of these well-known *Transactions*, in which, "for convenience and economy" the size of the page has been reduced from the handsome royal octavo to a demy octavo size. The volume contains over 450 pages, and some 17 plates. Among the more important contributions which are printed in the *Transactions* may be noted the following :—*Miscellaneous :* E. Tregear, the Maori in Asia.—Dr. J. Haast, stone weapons of the Moriori and the Maori.—Rev. S. W. Baker, new volcano in the Friendly Islands.—*Zoology :* T. Jeffery Parker, skeleton of Notornis.—T. White, feathers of two species of Moa.—A. Reischek, numerous papers on New Zealand birds.—W. Colenso, on the bones of a new species of Sphenodon.—W. W. Smith, on the habits of *Ocydromus australis*.—J. W. Kirk, on a new species of Argonauta.—Geo. M. Thomson and Chas. Chilton, critical list of New Zealand Crustacea Malacostraca.—E. Meyrick, New Zealand Micro-Lepidoptera (Tineina, Pars.).—A. T. Urquhart, on the spiders of New Zealand (many new species described and figured).—J. W. Kirk, on some species of Vorticella from Wellington describes thirteen species, of which two are given as new, and figured.—*Botany :* W. Colenso, on some newly-discovered cryptogamic plants of New Zealand, describes some fifty-nine species ; two ferns, fourteen mosses, and forty-three Hepaticæ, and hints that it may be the last lot of novelties that, owing to age, he may himself collect and describe.—On some new or rare native plants, chiefly phanerogams ; on *Clianthus puniceus*, Sol.—D. Petrie, on new species of native plants.—R. M. Lang, on classification of Algæ, and on the Fucoids of Banks Peninsula.—T. F. Cheeseman, three new species of Coprosma.—T. Kirk, additions to the flora of Nelson.—*Geology :* Capt. F. W. Hutton, the geology of Scinde Island ; new Tertiary shells ; the Wanganui system, with a catalogue of the Mollusca.—A. McKay, on the age of the Napier limestone.—*Astronomy :* Notes on the total eclipse of the sun of September 9, 1885, being a digest of many communications.—*Chemistry :* W. Skey, on a new mineral (awaruite) from Barn Bay.—W. S. Hamilton, on platinum crystals in the ironsands of Orepuki Goldfield.

Proceedings of the Linnean Society of New South Wales, vol. x. part 4, with 18 plates (Sydney, April 1886).—Dr. R. von

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[1] Clemens Winkler, *Journal f. prakt. Chemie*, 1886, pp. 177-229.

Lendenfeld, studies on Sponges: (1) the vestibule of *Dendrilla cavernosa*, sp.n.; (2) on *Raphyrus luxonii*, a new gigantic species from Port Jackson; (3) *Halme tingens*; (4) two cases of mimicry in Sponges (plates 39-43).—On recent changes in the forest flora of the interior of New South Wales; notes how the Pine Scrub (Callitris) rapidly supersedes the angiospermatous trees. The larva of a beetle (*Diadoscus erythrurus*) in part keeps the pine in check; drought seems favourable to the development of the beetle, or at least, by affecting the vegetation of the pine, enable its ravages to be more felt.—On the Australian fresh-water Rhizopoda.—On an Alga forming a pseudomorph of a siliceous Sponge.—On the dorsal papillæ of Onchidium.—Fourth addendum to the Australian Hydromedusæ.—E. P. Ramsay and J. Douglas-Ogilby, descriptions of many new or rare fishes.—George Masters, catalogue of the described Coleoptera of Australia, part 2.—N. de Miklouho-Maclay and Wm. Macleay, the Plagiostomata of the Pacific, part 3 (plates 45, 46).—A. Sidney Olliff: Trogositidæ of Australia.—On a new species of Chrysophanus.—On Australian Ptinidæ.—W. A. Haswell, on some Australian Polychæta, part 1 (plates 50-55).—E. Meyrick, Australian Micro-Lepidoptera.—J. Brazier, a new Ochidium.—New land and fresh-water Mollusca from New Guinea.

Second series, vol. i. part 1, with 6 plates (May 25, 1886).—E. P. Ramsay and J. Douglas-Ogilby, descriptions of new Australian fishes; new species of fish from New Guinea; a new Coris from the New Hebrides.—E. P. Ramsay, on a new genus and species of fresh-water tortoise from the Fly River, New Guinea (plates 3-6).—George Masters, catalogue of Australian Coleoptera, part 3.—F. Ratte, *Crioceras australe*, Moore (?), a Lower Cretaceous fossil from Queensland (plates 1, 2).—Wm. Macleay, the insects of the Fly River, New Guinea.—C. W. de Vis, on some Geckos in the Queensland Museum.—A. S. Olliff, on a new Aphanipterous insect from New South Wales.—Wm. A. Haswell, on the myology of *Petaurista taguanoides*.—Capt. F. W. Hutton, the Mollusca of the Pareora and Oamaru systems of New Zealand.

Proceedings of the Royal Society of Queensland, vol. ii. parts 1 and 2, June 1886, contain, among others:—W. E. Armit, notes on the philology of the islands adjacent to the south-eastern extremity of New Guinea (pp. 2-12), and on the Papuans (pp. 78-116).—C. W. De Vis, on the bones and teeth of a large extinct lizard (pp. 25-31, plates 1-3).—On an extinct Ornithorhynchus (pp. 35-40, plate 4).—On some new species of Salarias, and on a new species and genus of lizard (pp. 56-61).—On a fossil Saurian (pp. 181-192, plates 10-15).—Henry Tryon, on Queensland harvesting-ants.—W. A. Tully, short account of the measurement of the base-line in connection with the trigonometrical survey of Queensland.—Baron von Müller, on a new tiliaceous tree (*Elæocarpus Bancroftii*) from North Eastern Australia.

Proceedings of the Royal Society of Tasmania for 1885 (Tasmania, 1886).—From the records of the *Proceedings* it is interesting to learn that, though the Society has lost the exclusive control over the Museum and Gardens, which now are managed by trustees, some of whom are elected by the Society, yet the work of the Society continues to develop, and its library to increase. This volume is accompanied by a sketch-map, coloured, giving the general geological features of Tasmania, by C. P. Sprent and R. M. Johnston; and a geological chart, by Mr. Johnston, showing the proposed provisional classification of the stratified rocks of Tasmania and their equivalents elsewhere.—Among the more important papers we note the following:—R. M. Johnston, various memoirs on the geology and palæontology of Tasmania.—R. A. Bastow, on the mosses and Jungermania of Tasmania.—W. F. Pettard, new Tasmanian marine shells.—Baron F. von Müller, notes on J. J. H. de Labillardière (with a portrait).—Capt. Shortt, earthquake-phenomena in Tasmania.—T. Stevens, on boring for coal in Tasmania.

ON THE OCCURRENCE OF CELLULOSE IN TUBERCULOSIS

CELLULOSE, the principal constituent of the vegetable cell-wall, has been found to occur also in some animals; the mantle of *Phallusia mamillaris* and of Cynthia, and the external coat of Salpa consist mainly of tunicin, or animal cellulose. Now a further very valuable contribution to our knowledge of the occurrence of this body has been made in Vienna by Herr Ernst Freund, working at Prof. E. Ludwig's laboratory. Freund has succeeded in preparing from some of the organs and blood of tuberculous persons a substance exactly resembling cellulose, and showing all the reactions which have hitherto been described as peculiar to the latter. The reactions employed were the following:—(1) Conversion of cellulose when dissolved in concentrated sulphuric acid into dextrose on boiling with dilute sulphuric acid; (2) resistance if treated with Schultze's reagent, a mixture of nitric acid and chlorate of potassium; (3) yielding of a collodion-like mass by the action of nitric acid and ether; (4) assuming a blue colour by the action of iodine in presence of concentrated sulphuric acid or chloride of zinc solution; (5) assuming a violet colour by the action of a naphthol when dissolved in concentrated sulphuric acid (Molisch's reaction); (6) insolubility in common (indifferent) solvents (dilute alkalies); (7) solubility in a solution of cupric hydroxide in ammonia. The substance obtained from miliary tubercles and from the blood of tuberculous persons was subjected to ultimate analysis in three cases, and yielded between 45·12 and 44·70 per cent. C, and between 6·41 and 6·19 per cent. H; while 44·74 per cent. C and 6·17 per cent. H corresponds to $C_6H_{10}O_5$. A quantitative determination of the cellulose of the tubercles has not been made. The researches were carried out on material from twenty-five tuberculous and thirty non-tuberculous cases. The tuberculous material (lungs, spleen, peritoneum with miliary tubercles, blood) embraced cases of conglomerated as well as of infiltrated tuberculosis in the different stages of the disease. The non-tuberculous material examined was taken partly from healthy organs, partly from organs affected by various diseases—as, *e.g.*, from pneumonia, emphysema, pulmonary gangrene—and failed to show any of the reactions described above. Carcinomatous, sarcomatous, lupoid, syphilitic, and other non-tuberculous granulations were also examined with negative results. From his researches Herr Freund makes the suggestion that in tuberculous growths and in the blood of tuberculous persons cellulose forms an intrinsic constituent. We need not refer to the importance and suggestiveness of Freund's discovery for pathological science, making further researches on this subject very desirable.

DISINFECTION BY HEAT

THE Annual Report for 1884 of the Medical Officer of the Local Government Board contained a memoir, by Dr. H. F. Parsons, on the subject of disinfection by heat. Of this memoir the leading points are here given.

In considering the applicability of heat as a means of disinfection, several distinct questions present themselves for solution. It has first of all to be determined what degree of heat and duration of exposure are necessary under different conditions, as of moisture and dryness, in order to destroy with certainty the activity of the contagia of infectious diseases.

We have next to ascertain how the required degree of heat may be made to penetrate through bulky and badly conducting articles, *e.g.* of clothing and bedding, for the disinfection of which the application of heat is especially employed.

We have also to learn whether such articles can be submitted to the required degree of heat without injury, for if not, disinfection presents little advantage over destruction.

After giving a *résumé* of the results of previous experiments to ascertain the degree of heat necessary to destroy the contagia of infectious diseases, from those of Dr. Henry published in the *Philosophical Magazine* for 1831, to those of Koch and his coadjutors (*Mittheilungen aus dem kaiserlichen Gesundheitsamte*, Berlin, 1881), the author states the results of a series of experiments made by him in conjunction with Dr. Klein, who prepared the infective materials, and, after these had been exposed to disinfecting processes, tested the results by inoculation on animals; control inoculations with unheated portions of the same materials being also in all cases made.

The following were the infective materials employed:—

(1) Blood of guinea-pig dead of anthrax, containing bacillus anthracis without spores.

(2) Pure cultivation of bacillus anthracis in rabbit broth, without spores.

(3) Cultivation of bacillus anthracis in gelatine, with spores.

(4) Cultivation of bacillus of swine fever (infectious pneumo-enteritis of the pig) in pork broth.

(5) Tuberculous pus, from an abscess in a guinea-pig which had been inoculated with tubercle.